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Perceptions related to human avian influenza and their associations with anticipated psychological and behavioral responses at the onset of outbreak in the Hong Kong Chinese general population

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Background: Anticipated psychological responses and perceptions of risk have not been examined prior to the outbreak of an epidemic.

Methods: Using a cross-sectional, telephone survey, 805 Chinese adults in Hong Kong were interviewed anonymously in November, 2005 to examine beliefs related to H5N1 avian influenza and anticipated responses.

Results: Of respondents, 71.4% and 52.4%, respectively, believed that bird-to-human or human-to-human H5N1 transmission would occur in the next year. In the event of a bird-to-human or human-to-human outbreak in Hong Kong, many anticipated high fatality rates (70.5% and 74.4%, respectively), permanent physical damage (52.0% and 54.9%, respectively), inadequate vaccines (50.0% and 64.4%, respectively), insufficient medicine supplies (43.7% and 54.5%, respectively), inadequate hospital infection control (35.1% and 43.3%, respectively), high susceptibility of family members contracting H5N1 (13.9% and 24.3%, respectively), and impact on oneself/family worse than those of severe acute respiratory syndrome (21.2 and 25.0%, respectively). Most anticipated at least 1 of the 7 studied stress-related responses (e.g., panic) or the adoption of at least 1 of the 5 studied preventive behavioral measures (e.g., avoiding going out).

Conclusion: Panic and interruption of daily routines may occur in the event of a human avian influenza outbreak. Dissemination of accurate, timely information would reduce unnecessary distress and unwanted behaviors. (Am J Infect Control 2007;35:38-49.)

INTRODUCTION

It is widely anticipated that a global H5N1 avian influenza pandemic will occur in the near future.¹ High pathogenesis and fatality are expected,¹ and some experts have estimated that there could be as many as 7.4 million deaths.¹ From January 2003 until February 6, 2006, 165 laboratory confirmed cases and 88 deaths from bird-to-human transmissions were reported in 7 countries.² There are frequent, detailed reports in the media about this newly emerging infection, and people may be forming and rapidly changing their perceptions about this disease in the absence of

complete knowledge, as seen in the severe acute respiratory syndrome (SARS) epidemic.³ Concerning human avian influenza, given the high fatality rate,¹ the number of countries being affected,² as well the SARS experience,⁴ it is expected that an outbreak of the disease would result in a high level of psychological distress in the affected communities.

Human avian influenza preparedness needs to include the understanding and monitoring of disease-related perceptions and psychological responses. During the SARS epidemic, such perceptions affected the practice of public health behaviors such as frequent hand-washing and the wearing of face masks,³ which, in turn, contributed to the control of the epidemic.^{3,5} A high level of distress due to SARS was documented in the community,⁴ which was associated with SARS-related perceptions and public health behaviors;³ this underscores the need for psychological preparedness.

This study investigated the prevalence of perceptions related to human H5N1 avian influenza, anticipated psychological responses, and anticipated avoidance behaviors in the event of a local outbreak (i.e., if 2-3 new human cases of H5N1 were to be reported in Hong Kong). Factors that are associated

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with these anticipated psychological and behavioral responses were investigated. In this study, psychological and behavioral responses to human avian influenza were in reference to two situations: the onset of bird-to-human outbreaks and the onset of human-to-human outbreaks (Measurements).

METHODS

Study population and sampling

The study population consisted of Hong Kong Chinese adults aged 18 to 60 years. An anonymous cross-sectional telephone survey, using a structured questionnaire, was conducted in November of 2005 ($n = 805$). Random telephone numbers were selected from up-to-date telephone directories. Telephone calls were made by trained interviewers in the evening (from 6:30 PM to 10:00 PM) to avoid overrepresentation of unemployed persons. For unanswered calls, at least 3 other independent calls were made before considering the number to be invalid. Similar methods have been used in several studies on SARS³ as well as a study on avian influenza.^{6,7} The household member whose birthday was closest to the date of the interview was invited to join the study. Verbal informed consent was obtained from the respondents and ethics approval was obtained from the Ethics Committee of the Chinese University of Hong Kong. The response rate, defined as the number of completed interviews divided by the number of eligible households, was approximately 57%. Financial support was provided by the School of Public Health of the Chinese University of Hong Kong and institutional review was conducted by The Chinese University.

Measurements

Background variables were measured. Respondents were asked (1) about their level of emotional distress during the SARS epidemic on a scale ranging from 1 (not at all) to 10 (extremely distressed); (2) whether they avoided visiting hospitals in the last 3 months for fear of contracting avian influenza; (3) whether they had been eating less poultry meat in the last 3 months; and (4) whether they anticipated bird-to-bird, bird-to-human, and human-to-human H5N1 outbreaks to occur in Hong Kong, in mainland China, or in other places in the next 12 months.

Respondents were asked their perceptions about anticipated bird-to-human H5N1 outbreak in Hong Kong, including medical-related perceptions (perceived fatality, physical harm to patients, whether symptoms would be similar to those of SARS); preparedness of the local health authorities (adequacy of vaccines, medicine for treatment, and hospital

infection control); susceptibility of one's family members to avian influenza infection; and comparisons between consequences of an anticipated avian influenza epidemic with those of the SARS epidemic (in terms of infectivity, impact on oneself and his/her family, economic impacts, duration of the epidemic, and total number of people affected). Anticipated psychological distress from human avian influenza at an onset of bird-to-human H5N1 transmission (if 2-3 new human cases were to be reported) in Hong Kong was assessed by items, including whether the respondent would worry much about oneself or one's family members contracting the virus, be in a panic, be very upset, become very emotionally disturbed, face large impacts on one's daily life, and lack confidence in protecting oneself or one's family from contracting the virus. Avoidance behaviors that were examined included avoidance of hospitals, crowded places, going out, and going abroad, and the likelihood of not sending their children to school.

The above-mentioned perceptions and psychological/behavioral items related to bird-to-human H5N1 transmission in Hong Kong were asked only to a subset of all respondents ($n = 302$). For the rest of the respondents ($n = 503$), the same items were asked in the context of an anticipated human-to-human H5N1 outbreak in Hong Kong to keep the study instrument at a reasonable length for a telephone interview. Test-retest reliability has not been established.

Statistical analyses

Anticipated occurrence of the 3 types of H5N1 transmission in the next 12 months in Hong Kong was tabulated by different socio-demographic factors. Corresponding perceptions and anticipated psychological and behavioral responses related to bird-to-human and human-to-human H5N1 transmissions were compared by multivariate odds ratios (ORs), adjusting for socio-demographic factors (age, gender, educational level, marital status, employment status). Univariate ORs of factors in association with psychological and behavioral responses were presented. Univariate significant variables were used as candidates for multivariate logistic regression models. We used SPSS for Windows (version 11.1), and a P -value of $<.05$ was considered to be statistically significant.

RESULTS

Background characteristics

The socio-demographic characteristics of the respondents are summarized in Table 1. Of all respondents, 19.9% said that they had avoided visiting hospitals because of a fear of contracting avian

Table 1. Background characteristics of the respondents

	Gender		All (n = 805) %
	Male (n = 375)	Female (n = 430)	
	% of males	% of females	
Socio-demographic characteristics			
Age group			
18-24 years	16.5	14.4	15.4
25-29 years	19.5	23.0	21.4
30-34 years	26.7	27.9	27.3
35-39 years	25.3	24.9	25.1
40-60 years	12.0	9.8	10.8
Education level			
Secondary Form 5 or below	53.2	61.4	57.6
Matriculated or above	46.8	38.6	42.4
Marital status			
Ever married ^a	61.9	68.8	65.6
Never married	38.1	31.2	34.4
Employment status			
Not employed full-time	21.3	51.9	37.6
Employed full-time	78.7	48.1	62.4
SARS-related experiences			
Self-rated emotional distress during the SARS epidemic ^b (>75th percentile)	13.6	22.1	18.2
Current immediate behavioral responses			
Avoid visiting hospitals due to fear of avian influenza	17.1	22.3	19.9
Eating less poultry meat in the last 3 months	22.1	33.5	28.2

^aIncludes about 1.5% of all respondents who were currently separated/divorced or widowed.

^bRespondents were asked to rate their level of emotional distress during the SARS epidemic on a 1-10 point scale. A higher score denotes a higher level of emotional distress and the 75th percentile is 7.

influenza, and 28.2% reported they had been eating less poultry in the last 3 months (Table 1).

Anticipated likelihood of avian influenza outbreaks

Most of the respondents (86%) expected that bird-to-bird H5N1 outbreaks would occur in the coming year (Table 2). Corresponding figures were 71.4% for bird-to-human H5N1 outbreaks (in Hong Kong, 50.8%; mainland China, 66.1%; other places, 63.1%) and 52.4% for human-to-human H5N1 outbreaks (in Hong Kong, 33.5%; mainland China, 48.9%; other places, 44.0%). Those who were younger, better educated, and never married were more likely to anticipate bird-to-bird, bird-to-human, or human-to-human H5N1 outbreaks occurring in some locale in the next 12 months (education level was not associated with anticipated occurrence of human-to-human H5N1 outbreaks in some locale in the next 12 months) (Table 2).

Perceptions related to avian influenza in humans

Similar perceived high fatality rates were observed in the scenarios of bird-to-human and human-to-human H5N1 transmission (70.5% and 74.4%,

respectively) (Table 3). Perceived permanent physical damage and perceived similarity between symptoms of human avian influenza and SARS are reported in Table 3.

Of the respondents, 35.1% to 50.0% believed that local health authorities would not be adequately prepared in 3 aspects (vaccine, availability of medicine, control of nosocomial infection) in an anticipated local bird-to-human H5N1 outbreak. Similar figures (43.3%-63.4%) were obtained with respect to control of a local human-to-human H5N1 outbreak (Table 3). Of the respondents, 24.3% and 13.6%, respectively, perceived high or very high susceptibility for their family members to contract the virus at the onset of a human-to-human H5N1 outbreak or at the onset of a bird-to-human H5N1 outbreak in Hong Kong. In the case of a local human-to-human H5N1 outbreak, respondents tended to believe that local health authorities were less prepared (adjusted OR range, 1.45-1.79), and that their family members were highly susceptible (adjusted OR, 2.08; Table 3), as compared with a local bird-to-human H5N1 outbreak.

High percentages of respondents believed that a human-to-human H5N1 outbreak in Hong Kong would be worse than the past SARS experience in Hong Kong in terms of infectivity, impact on

Table 2. Anticipated occurrence of 3 types of H5N1 transmission in different places in the coming year

% Anticipated occurrence in the coming year:	Gender		P ^b	Age group		P ^b	Education level ^a		P ^b	Marital status		P ^b	All
	Male	Female		18-39	40-60		≤S.5	>S.5		Ever married	Never married		
	%	%		%	%		%	%		%	%		%
Bird-to-bird H5N1 transmission													
In Hong Kong	73.9	70.9	.35	78.0	67.1	<.01	68.1	78.2	<.01	69.3	78.0	<.01	72.3
In mainland China	81.9	79.8	.45	87.0	74.9	<.001	76.1	87.0	<.001	76.1	89.5	<.001	80.7
In other countries	77.6	75.1	.41	82.4	70.6	<.001	70.5	84.1	<.001	71.4	85.6	<.001	76.3
Anywhere	87.2	84.9	.35	90.7	81.6	<.001	83.3	89.4	<.05	82.8	92.1	<.001	86.0
Bird-to-human H5N1 transmission													
In Hong Kong	50.7	50.9	.94	57.0	45.1	<.01	46.2	57.2	<.01	45.5	61.0	<.001	50.8
In mainland China	68.0	64.4	.28	72.8	59.9	<.001	60.1	74.3	<.001	60.8	76.2	<.001	66.1
In other countries	63.7	62.6	.73	69.4	57.3	<.001	56.4	72.3	<.001	57.8	73.3	<.001	63.1
Anywhere	73.1	70.0	.34	78.0	65.4	<.001	66.2	78.8	<.001	65.9	81.9	<.001	71.4
Human-to-human H5N1 transmission													
In Hong Kong	30.4	36.3	.08	37.6	29.8	<.05	34.3	32.7	.65	30.3	39.7	<.01	33.5
In mainland China	44.8	52.6	<.05	52.3	45.8	.07	49.2	48.7	.87	45.5	55.6	<.01	48.9
In other countries	40.8	46.7	.09	50.5	37.9	<.001	41.9	46.9	.16	39.4	52.7	<.001	44.0
Anywhere	48.8	55.6	.06	56.5	48.7	<.05	52.3	52.8	.88	48.3	60.3	<.01	52.4

The statistically significant *P* values are in bold type.

^aS.5 = Secondary 5 education level (11 years of formal education).

^b χ^2 test.

oneself/family and on the economy of Hong Kong, duration of the pandemic, and total number of people affected (25.0%-40.4%; Table 3). The differences in the prevalence of perceptions with respect to bird-to-human versus human-to-human H5N1 outbreaks in Hong Kong were statistically significant for a number of affected persons and local economic impacts (Table 3).

Anticipated psychological responses and avoidance behaviors

More respondents would worry about themselves or their family members being affected by H5N1 at a human-to-human H5N1 outbreak (41.4% and 52.9% respectively), as compared with a bird-to-human H5N1 outbreak (28.8% and 35.4% respectively) (Table 4). Similar trends were observed for perceived large impact on daily life (47.1% versus 35.4%) and panic (19.7% versus 13.9%). Of the respondents, 22.9% and 16.2%, respectively, would expect to have at least one of the 4 items indicating distress (OR, 1.53; *P* < .05; Table 4).

The prevalence of anticipated avoidance behaviors relating to the 2 scenarios of human H5N1 outbreaks (bird-to-human versus human-to-human) transmission were, however, not significantly different from each other (Table 4). In either case, more than 70% of respondents would avoid visiting hospitals, crowded places, going out, or going abroad, and close to 30% would not allow their children to go to school (Table 4).

Factors associated with anticipated psychological responses

The multivariate results (Table 5) showed that those who felt much emotional distress (>75th percentile) during the SARS epidemic (OR, 2.63), and those who were eating less poultry in the last 3 months (OR, 2.33), believed that human-to-human H5N1 transmission would occur in the coming year (OR, 1.61), perceived that their family members would be highly susceptible to contracting the human-to-human H5N1 virus (OR, 3.08), believed that Hong Kong would not have adequate medicine for treatment at the time of a human-to-human outbreak (OR, 1.65), and perceived that there would be a larger impact on oneself and family members as compared with their SARS experience (OR, 2.04). These individuals also were more likely to anticipate a higher level of psychological distress (i.e., showing 4 or more responses that are associated with distress, Table 4) if 2 to 3 new cases of human-to-human H5N1 transmission were to be reported in Hong Kong (Table 5). Several variables were significant only in the univariate analysis (Table 5).

For the scenario of an anticipated local bird-to-human H5N1 outbreak, the multivariate results (Table 5) showed that those who had avoided visiting hospitals in the last 3 months (OR, 2.59), ate less poultry in the last 3 months (OR, 2.13), perceived their family to be highly susceptible to contracting H5N1 (OR, 2.63), believed that bird-to-human avian influenza would cause serious permanent physical damage (OR, 2.58),

Table 3. Perceptions related to human-to-human and bird-to-human H5N1 transmission

Perceptions related to H5N1 transmission	(Bird-to-human H5N1 ^a) (n = 302)	(Human-to-human H5N1 ^b) (n = 503)	OR _u (95% CI)	Adj. OR ^c (95% CI)
	Col %	Col %		
Medical aspects (% agreeing): ^d				
Has very high fatality rate	70.5	74.4	1.21 (0.88-1.67)	1.24 (0.90-1.71)
Cause permanent physical damages to patients	52.0	54.9	1.12 (0.84-1.50)	1.17 (0.87-1.56)
Has symptoms similar to those of SARS	42.1	45.7	1.16 (0.87-1.55)	1.20 (0.89-1.61)
Preparedness of health authorities in Hong Kong (% agreeing): ^d If human-to-human H5N1 outbreak occurs in Hong Kong,				
Hong Kong would not have adequate vaccine ^e	50.0	63.4	1.73*** (1.30-2.32)	1.79*** (1.33-2.40)
Hong Kong would not have adequate medicine/treatment ^e	43.7	54.5	1.54** (1.16-2.05)	1.57** (1.17-2.11)
Hospitals in Hong Kong would not have adequate infection control measures ^e	35.1	43.3	1.41* (1.05-1.90)	1.45* (1.07-1.95)
% Perceived high/very high susceptibility of one's family members in contracting H5N1 ^f	13.9	24.3	1.98*** (1.35-2.91)	2.08*** (1.41-3.09)
% Perceiving worse impacts of avian influenza as compared with those of SARS ^g				
Infectivity	40.1	40.4	1.01 (0.76-1.35)	1.05 (0.78-1.42)
Impacts onto oneself & the family	21.2	25.0	1.24 (0.88-1.75)	1.22 (0.86-1.73)
Economic impact on Hong Kong	30.5	36.8	1.33 (0.98-1.80)	1.38* (1.01-1.88)
Duration of the epidemic	39.4	40.4	1.04 (0.78-1.39)	1.06 (0.79-1.42)
Total number of people affected	31.1	38.6	1.39* (1.03-1.88)	1.41* (1.03-1.91)
Number of items with "worse than SARS" responses				
4-5	15.9	19.7	1.30 (0.89-1.89)	1.34 (0.91-1.97)
1-3	39.0	49.1		
None	35.1	31.2		

OR_u, univariate OR; Adj., adjusted; CI, confidence interval.^aThese questions about human-to-human H5N1 transmission were only asked to a subsample of 503 respondents (see Measurement).^bThese questions about bird-to-human H5N1 transmission were only asked to a subsample of 302 respondents (see Measurement).^cORs adjusted for gender, age groups, education level, marital status, and employment status.^dAnswer options include "agree," "disagree," and "not certain."^eAnswer options include "yes," "no," and "not certain."^fAnswer options include 'very high', 'high', 'low', 'very low', and 'not certain.'^gAnswer options include "worse than SARS," "better than SARS," "similar to SARS," and "not certain."

*P < .05.

**P < .01.

***P < .001.

perceived that bird-to-human avian influenza would have symptoms similar to those of SARS (OR, 2.47), and perceived that the bird-to-human avian influenza epidemic would have a worse economic impact on Hong Kong as compared with SARS (OR, 2.27) would be more likely to anticipate a higher level of distress at the onset of a bird-to-human transmitted H5N1 outbreak in Hong Kong. Some variables that were significant in the univariate analysis were not significant in the multivariate analysis (Table 5).

Factors associated with anticipated avoidance behaviors

The multivariate results showed that those who were older (OR, 1.83), felt highly emotionally distressed (>75th percentile) during the SARS epidemic (OR, 1.73), had avoided visiting hospitals because of avian

influenza in the last 3 months (OR, 1.76), were eating less poultry in the last 3 months (OR, 1.68), perceived that H5N1 would have a very high fatality (OR, 2.19), or perceived that avian influenza would have larger impacts on oneself and family as compared with SARS (OR = 1.74) were more likely to anticipate practicing more avoidance behaviors (i.e., >3 of the 5 studied avoidance behaviors) if 2 to 3 new cases of human-to-human H5N1 transmission were to be reported in Hong Kong (Table 6).

Concerning an anticipated onset of a local bird-to-human H5N1 outbreak, similar multivariate results showed that those who had avoided visiting hospitals (OR, 2.28), those who believed that the bird-to-human H5N1 would have very high fatality (OR, 2.09), or that the bird-to-human H5N1 would have higher infectivity than did SARS (OR, 2.22) would be more likely to anticipate practicing more avoidance

Table 4. Anticipated responses if 2 to 3 new human-to-human or 2 to 3 new bird-to-human H5N1 transmissions were to be reported in Hong Kong in the next 12 months

Anticipated responses when 2 to 3 H5N1 human cases were first reported in Hong Kong in the coming year	(Bird-to-human H5N1 ^a) Column %	(Human-to-human H5N1 ^b) Column %	OR _u (95% CI)	Adj. OR ^c (95% CI)
Psychological distress (% likely/very likely): ^d				
Worry much about oneself being affected	28.8	41.4	1.74*** (1.28-2.37)	1.83*** (1.34-2.50)
Worry much about family being affected	35.4	52.9	2.05*** (1.53-2.74)	2.17*** (1.61-2.94)
Much panic	13.9	19.7	1.52* (1.02-2.25)	1.58* (1.06-2.36)
Much upset	13.6	14.9	1.12 (0.74-1.68)	1.18 (0.78-1.80)
Very emotionally distressed	16.9	19.7	1.21 (0.83-1.75)	1.31 (0.89-1.91)
Large impact on one's daily life	35.4	47.1	1.62** (1.21-2.18)	1.59** (1.18-2.14)
Not confident to protect oneself & family members from contracting H5N1	15.6	19.1	1.28 (0.87-1.88)	1.33 (0.90-1.97)
Number of stressful responses (among the above 7 items)				
>3	16.2	22.9	1.53* (1.06-2.22)	1.63* (1.12-2.37)
1-3	45.7	57.7		
None	38.1	19.5		
Avoidance behaviors (% likely/very likely): ^d				
Would not send children to school	27.2	29.6	1.13 (0.82-1.55)	1.14 (0.83-1.58)
Would avoid visiting hospitals	71.2	71.0	0.99 (0.72-1.36)	1.02 (0.74-1.41)
Would avoid crowds	81.1	79.7	0.92 (0.64-1.31)	0.98 (0.68-1.43)
Would avoid going out	76.8	72.6	0.80 (0.57-1.11)	0.87 (0.62-1.22)
Reduce the number of times going abroad	76.8	78.9	1.13 (0.80-1.59)	1.14 (0.80-1.62)
Number of avoidance behaviors (any the above 5 items)				
4-5	57.0	56.5	0.98 (0.74-1.31)	1.00 (0.74-1.34)
1-3	37.4	38.0		
None	5.6	5.6		

OR_u, univariate OR; CI, confidence interval; Adj., adjusted.

^aThese questions about human-to-human H5N1 transmission were asked to a subsample of 503 respondents.

^bThese questions about bird-to-human H5N1 transmission were asked to a subsample of 302 respondents.

^cORs adjusted for gender, age groups, education level, marital status, and employment status.

^dAnswer options include "very likely," "likely," "unlikely," "very unlikely," and "not certain."

*P < .05.

**P < .01.

***P < .001.

behaviors (i.e., >3 of the 5 studied avoidance behaviors) (Table 6).

DISCUSSION

High levels of panic and distress in the general public were reported during and after the SARS epidemic.^{3,4} The fact that over one-half of the population anticipated a bird-to-human transmission in Hong Kong and that a large percentage of the local population reported that they would practice many avoidance behaviors in the event of an epidemic both suggest that it is likely that any human H5N1 outbreak would cause a very high level of psychological distress, even at the initial stages. Anxiety is expected to be greater if 2 to 3 new cases of human-to-human transmission are reported, as compared with the reporting of 2 to 3 new bird-to-human transmission cases in Hong Kong. During a local full-blown human avian flu outbreak, the level of psychological distress would be much higher than those just described. Fear of the unknown may

be a common feature of newly emerging infectious diseases. Therefore, the government should take steps to prevent general panic in the public from occurring. Similar results to those reported in studies of stress and quality of life during the SARS epidemic were found,⁴ and the perceived chance of one's family members contracting avian influenza also was associated with anticipated distress. Therefore, family counseling and psychological support would be an essential part of the response to an epidemic.

Implicit comparisons between human avian influenza and SARS may have been made by many respondents, because more than 40% of the respondents believed that SARS and human avian influenza have similar symptoms. The level of distress experienced during the SARS epidemic was associated significantly with anticipated distress and avoidance behaviors. The SARS epidemic caused tremendous damage to Hong Kong's population and many individuals exhibited posttraumatic stress symptoms.^{3,7} Hence, human avian influenza may elicit recollections of the respondent's

Table 5. Factors associated with anticipated psychological responses if 2 to 3 new human-to-human and 2 to 3 new bird-to-human H5N1 cases were to be reported in Hong Kong in the next 12 months

	>3 distress responses (onset of human-to-human H5N1 transmission) [‡]			>3 distress responses (onset of bird-to-human H5N1 transmission) [‡]		
	Row %	OR _u	OR _m	Row %	OR _u	OR _m
Socio-demographic factors						
Gender						
Male	19.2	1.00	—	14.2	1.00	—
Female	26.0	1.48 [~]		18.0	1.33	
Age groups						
18-39 years	20.7	1.00	—	15.2	1.00	—
40-60 years	24.8	1.26		17.2	1.16	
Education level						
≤Secondary Form 5 (11th grade)	22.9	1.00	—	16.2	1.00	—
>Secondary Form 5 (11th grade)	22.9	1.00		16.8	1.05	
Marital status						
Ever married	25.7	1.00	ns	18.8	1.00	—
Never married	18.1	0.64*		10.1	0.49 [~]	
Employment status						
Not employed full-time	22.6	1.00	—	10.6	1.00	—
Employed full-time	23.0	1.02		19.2	2.01 [~]	
SARS experiences						
Self-rated emotional distress during the SARS epidemic ^a						
≤75 th percentile	18.7	1.00	1.00	13.5	1.00	ns
>75 th percentile	41.1	3.02***	2.63***	29.4	2.66**	
Current immediate public health responses (last 3 months)						
Avoided visiting hospitals due to fear of avian influenza						
No	20.1	1.00	ns	12.6	1.00	1.00
Yes	33.7	2.02**		32.1	3.29**	2.59*
Eating less poultry meat in the last 3 months						
No	18.5	1.00	1.00	12.0	1.00	1.00
Yes	34.0	2.27***	2.33**	26.7	2.67**	2.13*
Anticipated occurrence in the coming year						
Bird-to-human H5N1 occurring in Hong Kong						
No	20.5	1.00	—	17.4	1.00	—
Yes	24.8	1.28		14.8	0.83	
Human-to-human H5N1 occurring in Hong Kong						
No	19.9	1.00	ns	14.2	1.00	—
Yes	28.0	1.57*		21.4	1.65	
Human-to-human H5N1 occurring in mainland China						
No	19.3	1.00	—	12.7	1.00	—
Yes	26.0	1.47 [~]		20.9	1.82 [~]	
Human-to-human H5N1 anywhere						
No	22.4	1.00	1.00	12.6	1.00	ns
Yes	25.3	1.77*	1.61*	35.4	1.92*	
Perceived susceptibility to contracting avian influenza						
Perceived susceptibility of one's family members to contracting avian influenza						
Low/very low/not certain	17.6	1.00	1.00	13.8	1.00	1.00
High/very high	39.3	3.04***	3.08***	31.0	2.79**	2.63*
Perceptions related to medical aspects of H5N1						
Has very high fatality rate						
Disagree/not certain	14.0	1.00	ns	9.0	1.00	ns
Agree	25.9	2.16**		19.2	2.41*	
Causes permanent physical damage to patients						
Disagree/not certain	18.1	1.00	ns	7.6	1.00	1.00
Agree	26.8	1.66*		24.2	3.89***	2.58*
Has symptoms similar to those of SARS						
Disagree/not certain	20.9	1.00	—	9.7	1.00	1.00
Agree	25.2	1.28		25.2	3.13***	2.47*

Table 5. Continued

	>3 distress responses (onset of human-to-human H5N1 transmission) [‡]			>3 distress responses (onset of bird-to-human H5N1 transmission) [‡]		
	Row %	OR _u	OR _m	Row %	OR _u	OR _m
Preparedness of health authorities in Hong Kong						
Hong Kong would not have adequate vaccine						
Disagree/not certain	15.8	1.00	ns	11.3	1.00	ns
Agree	27.0	1.97**		21.2	2.12*	
Hong Kong would not have adequate medicine/treatment						
Disagree/not certain	16.2	1.00	1.00	13.5	1.00	ns
Agree	28.5	2.07**	1.65*	19.7	1.57	
Hospitals in Hong Kong would not have adequate infection control measures						
Disagree/not certain	18.2	1.00	ns	12.8	1.00	ns
Agree	28.9	1.82**		22.6	2.00*	
Anticipated impact of avian influenza as compared with SARS						
Infectivity						
Better/same as SARS/uncertain	17.7	1.00	ns	14.4	1.00	—
Worse than SARS	30.5	2.05**		19.0	1.40	
Impact on oneself & family						
Better/same as SARS/uncertain	18.6	1.00	1.00	13.0	1.00	ns
Worse than SARS	35.7	2.44***	2.04**	28.1	2.61**	
Economic impact on Hong Kong						
Better/same as SARS/uncertain	22.0	1.00	—	11.0	1.00	1.00
Worse than SARS	24.3	1.14		28.3	3.20***	2.27*
Duration of the epidemic in Hong Kong						
Better/same as SARS/uncertain	21.0	1.00	—	16.4	1.00	—
Worse than SARS	25.6	1.30		16.0	0.97	
Total number of affected persons in Hong Kong						
Better/same as SARS/uncertain	17.8	1.00	ns	13.5	1.00	—
Worse than SARS	30.9	2.07**		22.3	1.85~	
No. of items with "worse than SARS" responses						
0-3	19.1	1.00	ns	13.0	1.00	ns
4-5	38.4	2.65***		33.3	3.35**	

ns = not significant.

— univariately nonsignificant.

OR_u = univariate OR; OR_m, ORs obtained from multivariate stepwise logistic regression using univariately significant variables as candidate variables; ns, not significant.

*Respondents were asked to rate their level of emotional distress during the SARS epidemic on a 1-10 point scale. A higher score denotes a higher level of emotional distress and the 75th percentile is 7.

~.05 < P < .01.

*P < .05.

**P < .01.

***P < .001.

[‡]Anticipated psychological distress responses listed in Table 4.

painful SARS-related experience, which may elevate the perceived level of distress that is due to human avian influenza. Therefore, particular attention must be given to those who were affected greatly by the SARS epidemics (e.g., patients, health care workers).

Most of the respondents anticipated that outbreaks of bird-to-human H5N1 would occur in some locale in the next year, but they were split in anticipating whether human-to-human H5N1 outbreaks would occur in the next year. Fewer respondents believed that such outbreaks would occur in Hong Kong than in mainland China and other countries, possibly because no H5N1 cases had been reported in birds or in humans in Hong Kong from March 2003 until the time of the

survey (November 2005). More people may anticipate human-to-human H5N1 outbreaks in Hong Kong in the near future because birds that are infected with H5N1 have been reported continuously in Hong Kong since January 2006. Therefore, another surveillance study is warranted.

Those who anticipated a human-to-human H5N1 outbreak in some locale in the coming year also were more likely to perceive higher levels of distress with the onset of a local human-to-human H5N1 outbreak. With the likelihood of a pandemic, the level of distress in a community cannot be determined by local factors only; panic in other countries may start a chain reaction. International efforts to reduce panic are

Table 6. Factors associated with anticipated avoidance behaviors if 2 to 3 new human-to-human and 2 to 3 new bird-to-human H5N1 cases were to be reported in Hong Kong in the next 12 months

	>3 avoidance behaviors (onset of human-to-human H5N1 transmission) [‡]			>3 avoidance behaviors (onset of bird-to-human H5N1 transmission) [‡]		
	Row %	OR _u	OR _m	Row %	OR _u	OR _m
Socio-demographic factors						
Gender						
Male	55.6	1.00	—	59.6	1.00	—
Female	57.2	1.07		54.7	0.82	
Age groups						
18-39 years	47.7	1.00	1.00	53.1	1.00	—
40-60 years	64.5	1.99***	1.83**	60.5	1.35	
Education level						
≤Secondary Form 5 (11th grade)	59.4	1.00	—	60.1	1.00	—
>Secondary Form 5 (11th grade)	52.3	0.75		52.0	0.72	
Marital status						
Ever married	61.9	1.00	ns	57.3	1.00	—
Never married	47.3	0.55**		56.2	0.96	
Employment status						
Not employed full-time	57.3	1.00	—	53.8	1.00	—
Employed full-time	55.9	0.95		58.6	1.21	
SARS experiences						
Self-rated emotional distress during the SARS epidemic ^a						
≤75 th percentile	53.4	1.00	1.00	55.4	1.00	—
>75 th percentile	68.4	1.89**	1.73*	64.7	1.48	
Current immediate public health responses (last 3 months)						
Avoided visiting hospitals due to fear of avian influenza						
No	52.9	1.00	1.00	52.8	1.00	1.00
Yes	70.2	2.10**	1.76*	75.0	2.68**	2.28*
Eating less poultry meat in the last 3 months						
No	51.7	1.00	1.00	54.6	1.00	—
Yes	68.8	2.06**	1.68*	62.8	1.40	
Anticipated occurrence in the coming year						
Bird-to-human H5N1 occurring in Hong Kong						
No	59.4	1.00	—	57.5	1.00	—
Yes	54.0	0.80		56.3	0.95	
Human-to-human H5N1 occurring in Hong Kong						
No	55.8	1.00	—	56.9	1.00	—
Yes	57.5	1.07		57.1	1.01	
Human-to-human H5N1 occurring in mainland China						
No	54.6	1.00	—	57.8	1.00	—
Yes	58.1	1.15		55.8	0.92	
Human-to-human H5N1 anywhere						
No	55.3	1.00	—	55.9	1.00	—
Yes	62.1	1.06		62.5	0.92	
Perceived susceptibility to contracting avian influenza						
Perceived susceptibility of one's family members to contracting avian influenza						
Low/very low/not certain	55.4	1.00	—	55.0	1.00	—
High/very high	59.8	1.20		69.0	1.83~	
Perceptions related to medical aspects of H5N1						
Has very high fatality						
Disagree/not certain	42.6	1.00	1.00	41.6	1.00	1.00
Agree	61.2	2.13***	2.19***	63.4	2.43**	2.09**
Causes permanent physical damage to patients						
Disagree/not certain	52.9	1.00	—	53.1	1.00	—
Agree	59.4	1.31		60.5	1.35	
Has symptoms similar to those of SARS						
Disagree/not certain	54.9	1.00	—	60.0	1.00	—
Agree	58.3	1.15		52.8	0.74	

Table 6. Continued

	>3 avoidance behaviors (onset of human-to-human H5N1 transmission) [‡]			>3 avoidance behaviors (onset of bird-to-human H5N1 transmission) [‡]		
	Row %	OR _u	OR _m	Row %	OR _u	OR _m
Preparedness of health authorities in Hong Kong						
Hong Kong would not have adequate vaccine						
Disagree/not certain	51.1	1.00	—	56.3	1.00	—
Agree	59.6	1.41 [~]		57.6	1.06	
Hong Kong would not have adequate medicine/treatment						
Disagree/not certain	50.7	1.00		57.1	1.00	—
Agree	61.3	1.54*	ns	56.8	0.99	
Hospitals in Hong Kong would not have adequate infection control measures						
Disagree/not certain	55.4	1.00	—	58.7	1.00	—
Agree	57.8	1.10		53.8	0.82	
Anticipated impact of avian influenza as compared with SARS						
Infectivity						
Better/same as SARS/uncertain	51.7	1.00	ns	48.6	1.00	1.00
Worse than SARS	63.5	1.63**		69.4	2.40***	2.22**
Impact on oneself & family						
Better/same as SARS/uncertain	52.0	1.00	1.00	55.0	1.00	—
Worse than SARS	69.8	2.14**	1.74*	64.1	1.46	
Economic impact on Hong Kong						
Better/same as SARS/uncertain	54.7	1.00	—	51.9	1.00	
Worse than SARS	59.5	1.21		68.5	2.01**	ns
Duration of the epidemic in Hong Kong						
Better/same as SARS/uncertain	53.3	1.00	—	51.9	1.00	
Worse than SARS	61.1	1.37 [~]		64.7	1.70*	ns
Total number of affected persons in Hong Kong						
Better/same as SARS/uncertain	54.0	1.00	—	50.5	1.00	
Worse than SARS	60.3	1.29		71.3	2.43**	ns
No. of items with 'worse than SARS' responses						
0-3	53.2	1.00	—	53.9	1.00	
4-5	69.7	2.02**		72.9	2.30*	ns

—univariately nonsignificant.

OR_u, univariate OR. OR_m, OR obtained from multivariate stepwise logistic regression using univariately significant variables as candidate variables; ns = not significant.[‡]Respondents were asked to rate their level of emotional distress during the SARS epidemic on a 1-10 point scale. A higher score denotes a higher level of emotional distress and the 75th percentile is 7.[~]0.05 < P < .01.

*P < .05.

**P < .01.

***P < .001.

[‡]Anticipated avoidance behaviors listed in Table 4.

warranted. In 1997, humans who were affected by H5N1 had been reported in Hong Kong, but not in other countries. According to our observations, not much distress seemed to exist in the public in Hong Kong, although this was not documented. Therefore, it is argued that whether a newly emerging infectious disease results in distress in the public depends on external factors (e.g., whether other countries are being affected) and local factors, such as experience with other diseases (e.g., SARS).

Human avian influenza was seen by many respondents to result in serious medical consequences that are in line with its high reported fatality.⁸ It is interesting to see that even before the onset of a newly

emerging infectious disease (in our case, human avian influenza), people may be changing their behaviors (e.g., avoiding visiting hospitals because of fear of contracting avian influenza infection and eating less poultry meat). This study showed that such behavioral changes were associated significantly with anticipated distress and anticipated avoidance behaviors. With the onset of a human avian influenza outbreak in Hong Kong, more than 50% would adopt at least 4 out of the 5 avoidance behaviors studied. There is little doubt that the local economy would be affected, even at the onset stage of a local human influenza epidemic. It is likely that the level of distress would be enhanced in a vicious cycle, as seen in the SARS epidemic.^{3,9}

Despite efforts made by the government, the respondents were not convinced that the local authorities are well-prepared for a human H5N1 epidemic. These beliefs also were associated with perceived distress and avoidance behaviors. The government needs to reassure the public continually about its preparedness, and to take behavioral and psychological community responses into account.

Although most key daily societal operations in Hong Kong and in other countries were maintained during the SARS epidemic, this could not be taken for granted in a full-scale human avian influenza epidemic, in view of the perceived high fatality and infectivity. There are areas of doubt—for example, whether health care workers and other frontline workers who have to work closely with affected patients will comply with their job instructions—as was found in the SARS epidemic. A study of this topic is warranted. Emergency plans and rehearsals need to be prepared by the government to deal with crisis, because there is a chance that some essential services may break down. The current governmental plans seem to be confined to vaccination, treatment, social distancing, and infection control,¹⁰ assuming all mechanisms will run smoothly. Psychological preparedness in the general population and in different social groups (e.g., health care workers) may have been overlooked. Timely dissemination of accurate information may reduce unnecessary panic. This may be the first essential step in promoting psychological preparedness within the community.

This study has several limitations. First, it was conducted using telephone surveys and some households may not have been included. In Hong Kong, however, almost all households have telephones¹¹ and a large number of local published studies on SARS³⁻⁵ or avian influenza^{6,12} have used this method. Because the attitudes and perceptions measured may change over time, especially when circumstances changes (e.g., reporting of new infection), telephone surveys have the advantage—over household surveys—of collecting data within a short period of time. The response rates of both types of surveys are comparable in the local setting. Second, the response rate of the study was not high. Again, the response rate was similar to many of the other local studies that have been published,^{11,13} with the distributions of 18- to 39-year-old and 40- to 60-year-old age groups being comparable to those obtained from the Census data (49.6% and 50.4%, respectively). When we asked about the perceived adequacy of vaccine, we used the term “vaccine” and did not specify what type of vaccine, because an H5N1 vaccine is not available. This is assessing the subjective perception of a hypothetical situation in the future, and the way of asking should be

acceptable. The gender distributions (46.6% male and 53.4% female) also were comparable to the Census distributions (47.8% male and 52.0% female).¹⁴ Adoption of behavioral responses was self-reported and had not been validated. Test–retest reliability was not established; however, during this preoutbreak stage, it is unlikely that social desirability strongly biased the reporting of these behaviors. Recall bias also is unlikely to be significant because of the short recall period of 1 to 3 months.

In summary, high proportions of respondents anticipated that bird-to-human and human-to-human H5N1 outbreaks would occur in Hong Kong or in some other locale in the coming year. It is very likely that even at the onset of a human avian influenza epidemic—regardless of whether it is a bird-to-human or human-to-human transmission—widespread distress, panic, and avoidance behaviors would occur in Hong Kong as well as in the other affected countries. It is very likely that the economy and daily life in the affected societies will be affected severely. Because a pandemic may occur, the level of distress may be worse than that during the SARS epidemic. Therefore, psychological preparedness in the community is essential; however, caution should be exercised in extrapolating the observed results to other countries because Hong Kong has its own unique SARS experience. Other countries that are concerned about avian influenza should carry out their own assessment and surveillance on the potential impact of avian influenza. The government should proactively reassure the public about its preparedness and include provision of family psychological counseling services and emergency plans to deal with any crisis situation. Surveillance of perceptions and responses of the general public also should become a regular part of the preparatory plans.

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